Claims

[c1] A method of designing a layout of an integrated circuit
using an alternating phase shift mask, the method com-
prising the steps of:
providing at least two design objects for designing a
phase-shiftable feature in the layout, each design object
including:
a base shape,
a first phase shape identifier assigned to a first portion
of the base shape, the first phase shape identifier having
a first type, and
a second phase shape identifier assigned to a second
portion of the base shape, the second phase shape iden-
tifier having a second different type; and
allowing placement of the design object overlapping an-
other design object during design of the layout only in
the case that the types of any overlapping phase shape
identifiers are compatible.

[c2] The method of claim 1, wherein each design object fur-
ther includes a buffer, the method further comprising
the step of:
allowing placement of a design object adjacent another

design object during design of the layout where adjacent phase shape identifiers have different types only in the case that the design objects are distanced from one another by a distance greater than the buffer.

[c3]   The method of claim 1, wherein each portion is a side of a respective base shape.

[c4]   The method of claim 1, wherein the base shape includes a line.

[c5]   The method of claim 1, wherein each phase shape identifier indicates a requisite mask area.

[c6]   The method of claim 1, wherein each phase shape identifier indicates a color of phase-shift required for the base shape.

[c7]   The method of claim 1, further comprising the step of providing a design shape for designing a non-phase-shiftable feature in the layout.

[c8]   A computer program product comprising a computer useable medium having computer readable program code embodied therein for designing an integrated circuit layout using an alternating phase shift mask, the program product comprising:
program code configured to provide a plurality of se-

lectable design objects for designing at least one phase-shiftable design feature in the layout, each design object including:

a base shape,

a first phase shape identifier assigned to a first portion of the base shape, the first phase shape identifier having a first type, and

a second phase shape identifier assigned to a second portion of the base shape, the second phase shape identifier having a second type; and

program code configured to allow placement of the design object overlapping another design object during design of the layout only in the case that the types of any overlapping phase shape identifiers are compatible.

[c9] The program product of claim 8, wherein each design object further includes a buffer, the program product further comprising the step of:

program code configured to allow placement of a design object adjacent another design object during design of the layout where adjacent phase shape identifiers have different types only in the case that the design objects are distanced from one another by a distance greater than the buffer.

[c10] The program product of claim 8, wherein each portion is a side of a respective base shape.

[c11] The program product of claim 8, wherein the base shape includes a line.

[c12] The program product of claim 11, wherein each portion is a side of the line.

[c13] The program product of claim 8, further comprising program code configured to provide a plurality of design shapes for designing at least one lithographic shape in the layout.

[c14] An integrated circuit design system comprising:
means for providing a plurality of selectable design objects for designing at least one phase-shiftable design feature in the layout, each design object including:
a base shape,
a first phase shape identifier assigned to a first portion of the base shape, the first phase shape identifier having a first type, and
a second phase shape identifier assigned to a second portion of the base shape, the second phase shape identifier having a second type; and
means for allowing placement of the design object overlapping another design object during design of the layout only in the case that the types of any overlapping phase shape identifiers are compatible.

[c15] The design system of claim 14, wherein each design object further includes a buffer, the design system further comprising: means for allowing placement of a design object adjacent another design object during design of the layout where adjacent phase shape identifiers have different types only in the case that the design objects are distanced from one another by a distance greater than the buffer.

[c16] The design system of claim 14, wherein each portion is a side of a respective base shape.

[c17] The design system of claim 14, wherein the base shape includes a line.

[c18] The design system of claim 14, wherein each phase shape identifier indicates a requisite mask area.

[c19] The design system of claim 14, wherein each phase shape identifier indicates a color of phase-shift required for the base shape.

[c20] The design system of claim 14, further comprising means for providing a design shape for designing a non-phase-shiftable feature in the layout.